

THURSDAY, SEPTEMBER 14, 1905.

## ASTRONOMY FOR TRAVELLERS.

*Handbuch der geographischen Ortbestimmung für Geographen und Forschungsreisende.* By Dr. Adolf Marcuse. Pp. x+342+2 charts; illustrated. (Brunswick: Friedrich Vieweg und Sohn, 1905.)

A SHORT preface by the author tells us that this book is designed, in the first place, to give assistance to geographers and explorers, to aid students of the mathematical sciences and pupils in the higher schools, and to serve as an introduction to those parts of astronomy which, since they are concerned with the determination of time and of position on the earth's surface, have an important influence on everyday life. One does not expect, therefore, a description or an explanation of the nicest details that lead to the greatest accuracy, but rather the exhibition of the general principles on which the determination of coordinates depends; and on the whole this ground is fairly well covered, both from a theoretical and practical point of view. But when an author poses as a teacher, we are apt to examine his book a little closely, to see if he has shown any sign of clearly apprehending the difficulties that learners and pupils encounter when attacking a new subject, and made any adequate effort to remove these difficulties. There is no evidence of any particular care in this direction, though, of course, it is no easy matter to detect beforehand where the pitfalls and misconceptions on the part of the pupil will arise, and points that seem to one teacher to demand a lengthened explanation or further illustration do not present themselves in the same way to the judgment of another expert.

But there is another test which may be more safely applied. Are any matters introduced which give needless complexity, or delay the continuous progress of the work? In this respect we think the author is not altogether blameless. For instance, the section on "probable error" and the solution of equations by the method of least squares seems on this ground out of place. The subject in the space given to it is not, and cannot be, treated exhaustively; it must leave but a very hazy notion in the student's mind, and the application of the theory is not wanted in the discussion of the rough results which are derived from the instruments that are employed. Similarly, what has a traveller dealing with approximate values of latitude and longitude to do with the small variations arising from the motion of the Pole? It seems a little inconsistent to suggest a degree of accuracy in the final results which cannot be realised with the particular means adopted.

If these are details into which it would have been better not to have entered, there are, on the other hand, omissions, or at least what appear to be omissions, to which some reference should have been made. Thus, by way of illustration, we may mention the absence of all reference to the sextant and artificial horizon in the portion of the book devoted to the description of instruments. The author is

perhaps desirous that his book should not be confounded with the many treatises on nautical astronomy and the methods of reduction therein employed; but the sextant has as distinct a value in exploring new country as the chronometer, to which the author devotes a very satisfactory section. In the determination of longitude, the sextant applied to the measurement of lunar distances affords more trustworthy results than does the observation of Jupiter's satellites, on which the author would apparently rely. Occultations of stars by the moon, which is merely a particular case of the method of lunar distances, are referred to at considerable length. A numerical example of the application of the method is worked out in full, and in all the various methods of deriving the latitude and longitude detailed examples are furnished. This is a very satisfactory feature of the book, and we could have wished that the selection of examples had been more varied and had included the method of lunar distances.

If these omissions seem to us to be slight blemishes on an otherwise excellent book, it is with the greater pleasure that one can turn to the consideration of the sections which treat of matters of more novelty and originality. In the chapter devoted to instruments we meet with a "level-quadrant" (Libellenquadrant) with which we are unfamiliar, and though it appears to be distinctly inferior to the sextant, it may be of advantage in some situations. The peculiar feature of the instrument consists in the fact that the bubble of a level carried on a rotating arm is reflected into the field of view and made to do the same service as the reflection of the sun to the horizon by means of the ordinary arrangements found in the sextant. In the case of determining the position of a balloon when the earth may be invisible owing to clouds passing beneath the observer, such an arrangement can be used with effect. In the chapter on the determination of a balloon's course, the method is applied with very considerable success. The path of a balloon from Berlin to a point beyond Breslau, a complete run of about 400 kilometres, is worked out, and the average error appears to be about 16 kilometres. This would be a large error on board ship, but the conditions are not the same, nor is there the same necessity for accuracy. The aeronaut has simply to take care that he does not run out to sea; the navigating officer has to make a land fall. The calculations in this section have been materially shortened by the use of the so-called Mercator function, which, in the examples given, does away with the necessity of logarithmic tables, and suggests a method of working that seems to be well worth the little study that is necessary to master the application of it.

Lastly, we may mention an ingenious method of determining approximately geographical positions without the use of graduated instruments. Threads supporting a weight at the apex of a triangle so as to ensure verticality and to give steadiness can be hung on tent poles, and over these threads the transit of stars can be observed with the naked eye. Then, knowing the time, the latitude, longitude, and azimuth can be approximately derived; and when

instruments have been injured or delayed, or are generally inaccessible, such methods are not to be despised. It would be an admirable exercise for anyone, whether he travels or not, to accustom himself to the use of such tools, and learn to what degree of accuracy he can rely on such devices.

#### THE EVOLUTION OF HUMAN SOCIETY.

*La Sociologie génétique.* By François Cosentini. Introduction by Maxime Kovalevsky. Pp. xviii + 205. (Paris: F. Alcan, 1905.) Price 3.75 francs.

**I**N a short compass this book gives an excellent bird's-eye view of a very wide territory. It begins with a discussion of the data available for the study of the evolution of human society. Even animal associations are not neglected, but, naturally, more space is devoted to the beliefs and customs of savage tribes. Our author decides wisely with regard to primitive man that much is to be learnt thus. But he deprecates rash inferences. The ancestors of civilised man, there is reason to believe, never ceased to make progress. The savages of the present day have stagnated, and may, in some cases, have retrograded. Still, when the theories that suggest themselves to the investigator of savages and their ways are modified and corrected by the study of the institutions, the beliefs, the folk-lore of civilised peoples, it is probable that the risk of serious error is reduced to very small proportions.

M. Cosentini decides in favour of a polyphyletic origin of the human race, arguing partly from the reduced fertility observable when two widely different types interbreed. After a brief but interesting account of the Palæolithic and Neolithic ages, he deals with the origin of the family. Here, as elsewhere, he shows sound judgment in his treatment of the various rival theories. He refuses to regard the patriarchal family as primitive. The more primitive the community the less sign is there of patriarchal authority. On the other hand, it would be foolish to maintain that there was ever a time in which woman was absolutely predominant. This view is precluded by the fact that primitive man had to wage incessant war against wild beasts and almost incessant war against hostile tribes. But there is abundant evidence that there was a time when a man was known as his mother's son and not as his father's, when pedigrees were traced through the female line, and when women had much more power and influence than at a later period when the patriarchal system had been developed. When the tendency changed and the paterfamilias became an autocrat within his own household, civilisation made great progress.

The family has been the nucleus which has made the higher civilisation possible, a point which, perhaps, M. Cosentini does not sufficiently recognise. Our author is, no doubt, right in holding that the idea of the family grew out of the idea of private property. The wife was the property of her husband. In very many cases he had captured her as he had captured his cattle. But with regard to monogamy, M. Cosentini does not bring out the interesting fact

that in northern climes, where it is most firmly rooted, it derives its strength mainly from the fact that one man's labour suffices for the feeding and clothing of only a small number of children. Even among animals we find the same thing. Where the work of both parents is required for the bringing up of the young, there the system of pairing is the rule. Where the young are precocious and are soon able to fend for themselves, polygamy arises.

On the remainder of the book want of space forbids us to comment at length. It deals with animism, myths, language, religion, morality, law, the origin of social classes, art, industry, and commerce. The style is clear; and throughout the book M. Cosentini proves himself a fair critic and a clear-headed thinker.

F. W. H.

#### OUR BOOK SHELF.

*Trees.* By H. Marshall Ward. Vol. iii. Flowers and Inflorescences. Pp. xii+402. (Cambridge: The University Press, 1905.) Price 4s. 6d. net.

THE first two volumes of the above work have been previously noticed in these columns. The present volume, which deals with flowers, is, like the others, divided into two parts. Part i. deals with the flower in general. The author has been very successful in his treatment of this vast subject; he has brought together and arranged his facts in such a clear and simple manner that the beginner should have no difficulty in gaining a very comprehensive knowledge concerning the different kinds of inflorescences, the structure and development of flowers, as well as the meaning of their various forms and modifications. So far as possible technical terms have been carefully avoided, but at the same time it is quite impossible to treat a subject like this without using one or two terms which have a special meaning of their own which cannot be readily put into every-day language. Wherever such expressions are used their meaning is always carefully explained, and at the end of the book a useful glossary is given which will remove all mystery concerning these terms should any such exist.

The author has naturally confined himself to a critical examination of the flowers of trees and shrubs, and the student will find here an epitome of the natural system of classification, and when this epitome has been mastered he will be in a position to understand the structure and form of the flowers of cultivated and wild herbaceous plants as well.

Part ii. is more of the nature of a flora, *i.e.* the author has given in tabular form a general conspectus of woody plants and their flowers, by which means any given species may be easily diagnosed at flowering time.

It is a well known fact that the willows are almost, if not, the most difficult family to deal with as regards their identification. Apart from their tendency to hybridise with each other, the willows are dioecious, which renders their identification very difficult when only one kind of flower is available. The author has very ingeniously overcome this difficulty by giving a special table as an appendix wherein the separate characters of the male and female flowers are used for the purposes of diagnosis.

This volume, like the other two, is profusely illustrated. There is also a very useful and exhaustive index at the end of the book. While vol. i., "Buds and Twigs," is a book for the winter study of trees and shrubs, we have in vol. iii. a book which is specially adapted for use in summer.